

Annotated Bibliography of the Mountain Quail

Oreortyx pictus



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This bibliography encompasses most of the published scientific literature on mountain quail up to November 1998. References vary from critical scientific studies to those making casual reference to quail. Species lists referring to mountain quail and books on wildlife are the newest editions. Reference to typescript, multilith and mimeograph reports of government and professional agencies is undoubtedly incomplete, however, many of these citations presented may lead one to discover other such reports by the same author if further inquiry is made. A few articles are incompletely cited but are included in the hope that their source may be known or discovered by the interested reader. Articles about hunting mountain quail in outdoor magazines are not included. A plea is made to all readers for submission of corrections regarding incorrect, incomplete, or omitted citations. Notification of future articles on mountain quail will also be appreciated for inclusion in a revised edition of this bibliography.

Most entries in the bibliography are followed by one of three words in bold:

Abstract, Excerpt or Notes. These are included to help the reader know the source of the text. "Abstract" is the abstract from the article, "Excerpt" quotes important text from the article, and "Notes" is our summary of information from the article. Following the bibliography, we included an author index, a location index, and a subject index for ease of use. The numbers in the indices correspond to the number preceding each individual citation.

1. Alcorn, J. R. 1988. The birds of Nevada. Fairview West Publ., Fallon, Nev. 418pp.
Excerpt: Status in Nevada. Sparse resident in western part of the state. Uncommon in northern, central and southwestern part of the state. In good quail years, these birds become abundant in selected areas, often followed by a dramatic drop in the population. Stiver (pers. comm, 1986) reported, "I suspect they are relatively widely distributed, our most widely distributed native quail." He noted they were locally common, but limited populations exist.
2. Aldrich, J. W., and A. J. Duvall. 1955. Distribution of American gallinaceous game birds. U.S. Fish and Wildl. Serv., Circ. 34. U.S. Gov. Printing Office, Wash., D. C. 30pp. **Excerpt:** Range.--Native to mountains of Pacific coastal region of extreme western United States. Established after introduction in mountains of eastern Washington, western Idaho, eastern Oregon, and central Nevada. Habitat.--Brushy clearings in forested areas in mountains. Sprout-grown areas appearing after burns are characteristic habitat. Northwestern Mexican race occurs in pine-oak forest and adjacent chaparral. Individuals that nest at higher altitudes usually migrate to lower mountain levels in winter.
3. Allen, A. S. 1928. Additional notes on the birds of the Gold Lake Region, Northern Sierra Nevada. Condor 30:361-362. **Excerpt:** Mountain Quail were found on the shore of Gold Lake.
4. Allen, G. A., III. 1990. Mountain quail. Game Bird Breeders, Aviculturists, Zool. and Conserv. Gaz. Sept.:40-42. **Notes:** Author includes information on general description, monomorphism, migration, habitat, breeding and nests, captive breeding and care, egg production and storage, egg incubation, and hatching and rearing of captive chicks.
5. American Ornithologists' Union. 1910. Check-list of North American birds. Third ed. Am. Ornithol. Union, Ithaca, N.Y. 430pp. **Notes:** This listing includes *Oreortyx picta*, *O. p. picta*, *O. p. plumifera*, and *O. p. confinis*. Only a general description of range for each subspecies is included.
6. American Ornithologists' Union. 1931. Check-list of North American birds. Fourth ed. Am. Ornithol. Union, Ithaca, N.Y. 691pp. **Notes:** This listing includes *Oreortyx picta*, *O. p. palmeri*, *O. p. picta*, and *O. p. confinis*. Only a general description of range for each subspecies is included.
7. American Ornithologists' Union. 1957. Check-list of North American birds. Fifth ed. Am. Ornithol. Union, Ithaca, N.Y. 691pp. **Notes:** This listing includes *Oreortyx pictus*, *O. p. palmeri*, *O. p. pictus*, *O. p. eremophilus*, *O. p. russelli*, and *O. p. confinis*. A general description of range and introduced or resident status is Given for each subspecies.

8. American Ornithologists' Union. 1983. Check-list of North American birds. Sixth ed. Am. Ornithol. Union, Wash., D.C. 877pp. **Excerpt:** Habitat.--Brushy mountainsides, coniferous forest, forest and meadow edges, dense undergrowth, and in more arid conditions in sagebrush, pinyon and juniper. Distribution.--*Resident* from southwestern British Columbia (on Vancouver Island, where introduced but perhaps also native), western and southern Washington, and central Idaho south through the mountains of California and northern and western Nevada to northern Baja California (Sierra Juárez and Sierra San Pedro Martir).
9. Anderson, M. P., and J. Grinnell. 1903. Birds of the Siskiyou Mountains, California: a problem in distribution. Pages 4-15. Proc. Acad. Nat. Sci. Philadelphia.
10. Anthony, A. W. 1889. New birds from Lower California, Mexico. Proc. Calif. Acad. Sci. 2(2):73-82. **Excerpt:** From an elevation of 6,000 to 10,000 feet above the sea, in the San Pedro Mountains, I found this quail abundant, occurring wherever water and timber afforded it drink and shelter, and only leaving the higher elevations when the frosts of winter make life in the lower valleys desirable. A few pairs bred about my camp at Valladores, 6 miles from the base of the range and 2,500 feet above the sea; but nearly all of the flocks that wintered along the creek at this point were gone in March, leaving only an occasional pair, which sought the shelter of the manzanitas high up on the hill-sides, from whence their clear, mellow notes were heard morning and evening, so suggestive of cool brooks and rustling pines, but so out of place in the hot, barren hills of that region.
11. Anthony, A. W. 1893. Birds of San Pedro Martir, Lower California. Zoe 4:228-247. **Excerpt:** *Oreortyx pictus confinis*. San Pedro Partridge. Since describing this race, I have secured a series of skins from San Diego County, California, that are practically identical with my skins from Lower California, San Pedro and Valladares, thus making it necessary to either ignore the Lower California bird, or to include Southern California in its habitat. I am unable to secure specimens from the type locality at present, and so cannot determine the status of the race beyond a doubt. A single skin from the collection of the California Academy of Sciences, from Monterey, is slightly darker above and shows a conspicuous rusty edging to several of the secondaries, forming a patch on the closed wing not seen in any of my southern birds. During the past season partridges were found in abundance all over San Pedro Martir and fresh eggs were taken from the time of our arrival May 5 to the last day, May 28. In the Gaudaloupe Valley, forty miles south of Ensenada, several *Oreortyx* were seen in the thick chaparral of *Ceanothus*, almost down to the coast.
12. Anthony, A. W. 1911. Notes on some species from eastern Oregon. Auk 28:274-275. **Excerpt:** The winter of 1909-1910 was perhaps the most severe that has been experienced in eastern Oregon during the past 20 years. The unusual amount of snow, as well as the long continued cold, caused the death of many birds and to some extent forced others to change their normal habits. A flock of a dozen

Oreortyx was several times seen feeding on stable refuse hauled out from the town of Vale, Malheur County. Just where these wanderers came from would be a problem, as the nearest body of timber, the natural home of the species, is about 75 miles to the westward, and so far as I can learn the species is not found there.

13. Anthony, A. W. 1912. Eastern Oregon notes. Auk 29:253. **Excerpt:** In 'The Auk' for April, 1911, was published a note extending the range of *Oreortyx*, to all intents, to the Idaho boundary, the exact limit being 15 miles west of the Snake river, at Vale, Oregon. Since this article appeared further data on this species lead me to think that this partridge is gradually extending its range eastward. They were found rather common and nesting 15 miles above Vale along Bully Creek, a tributary of the Malheur river, also they were reported rather common at Skull Springs some 50 miles southwest of Vale. A flock of young was seen at Willow Creek a few miles above Ironside at the base of the Burnt River Mts. Reports of the presence of the species have been received from several of the tributaries of the Malheur River proving that the bird is more or less generally distributed over a considerable extent of the eastern part of the state. Following a rumor that the "California Quail" had been introduced I made inquiry of several of the settlers but found nothing to confirm such report. The Partridge seems first to have appeared on Upper Willow Creek about 10 or 12 years ago and gradually became somewhat common. The hard winter of 1905-06, drove many flocks to the barnyards for food, where it would seem they met with almost universal destruction at the hands of settlers. For several years they were not seen at all, but are again becoming somewhat common. No specimens have been examined, I am therefore unable to state how the species compares with those from the Cascades and Coast Mts.
14. Anthony, H. E. 1913. Mammals of northern Malheur County, Oregon. Am. Mus. Nat. Hist. Bull. 32(1):1-27. **Notes:** The mountain quail (*Oreortyx pictus plumifera*) was found along Willow Creek, Oregon, in willow/alder habitat and in adjacent meadows during a census completed in May, August, and early September.
15. Arvey, M. D. 1940. A preliminary check-list of the birds of northern Idaho. M.S. Thesis, Univ. Id., Moscow. 42pp. **Excerpt:** *Oreortyx picta*. Mountain quail. -- Two adult males of this species were collected in Idaho County near the Little Salmon River in May, 1939. They seem restricted to a typical transition zone type of plant association.
16. Arvey, M. D. 1947. A check-list of the birds of Idaho. Mus. Nat. Hist. Univ. Kans. Pub. 1(10):193-216.
17. Audubon, J. J. 1839. A synopsis of the birds of North America. Adam & Charles Black, Edinburgh, London. 359pp. **Notes:** The author provides a detailed physical description of *Ortyx plumifera* Gould, and designates it a rather rare migratory bird of the Columbia River area and upper California.

18. Audubon, J. J. 1937. The birds of America. MacMillan Co., New York, N.Y. 513pp.
19. Bach, E. D. 1917. Mountain quail. Calif. Fish and Game 3(1):139. **Excerpt:** Mountain quail are getting very scarce in all parts of the Stanislaus National Forest, and at the rate they are disappearing, it will be a matter of a few years only until they are extinct. Very little hunting is done for this species alone, but quite a number are bagged during a season by hunters in pursuit of other game. Their nests are made on the ground, which would have something to do with their disappearance, since they naturally become a prey to snakes, and small predatory animals during the nesting period, mature birds as well as young and eggs being taken. Mountain quail leave their winter haunts about April, traveling toward the higher altitudes, some stopping along the way to build their nests and rear their young, while others cross the summit and build their nests on the east side. The fall migration begins the latter part of August, and the birds return to altitudes of from two to three thousand feet about October, and here they winter. They feed on grass, seeds, berries and pine nuts.
20. Bade, A. 1932. Artificial methods of propagating game birds. Calif. Fish and Game 18:117-131.
21. Bailey, F. M. 1902. Handbook of birds of the western United States. Houghton, Mifflin & Co., Riverside Press, Cambridge. 514pp. **Excerpt:** In winter when there are heavy snows on the mountains, the quail come down to the foothills, and have even been seen in Pasadena, three miles from the base of the mountains. In summer they are most abundant in the dense chaparral of Transition zone, though they go much higher.
22. Baird, S. F., T. M. Brewer, and R. Ridgway. 1874. A history of North American birds: land birds. Vol. 3. Little, Brown, and Co., Boston. 560pp. **Excerpt:** It [mountain quail] is nowhere very common, but occurs sparingly throughout the entire length of California and Oregon to at least the Columbia, and probably beyond it, having much the same range with the *californicus*, though everywhere a rarer bird, and always confined to the hills and mountains. . . According to Dr. Cooper, this Quail is very rare in Washington Territory, a few small coveys having been met with about Vancouver, as he was informed by the officers in the garrison. He never succeeded in finding any, though he hunted for them several times with a dog. They became quite common south of the Columbia, towards the prairies of the Willamette. He inquired especially for them in other parts of the Territory, but never heard of them. In California, south of San Francisco, this bird is said to be a rare curiosity to the market-hunters, one or two sometimes occurring among flocks of the California Quail. It is known to them as the Mountain Quail. Dr. Suckley states that the birds in the Willamette Valley were introduced there, and that they are now multiplying rapidly upon the prairies back of Fort Vancouver. . .

Mr. Ridgway met with the Mountain Quail on the foot-hills of the Sierra Nevada, in the vicinity of Genoa and Carson City, and also in the mountain ranges lying immediately to the eastward of the Sierra. It was quite rare and very difficult to discover, and when found was generally met with accidentally. . . The settlers in Nevada say that, previous to the settlement of that country by the whites, this Quail was not found east of the Sierra Nevada, and affirm that they followed the wagon-roads over the mountains, in the rear of trains and wagons, for the purpose of picking up the grain scattered along the road. Mr. Ridgway does not give full credit to the truth of these statements, as he was informed by the Indians at Pyramid Lake, that, within the memory of the oldest members of their tribe, it had always been found in that vicinity. **Notes:** Author includes a physical description, distribution, and habits. Noted to occur in mountain ranges of western California and Oregon, and in the eastern Sierra Nevada.

23. Barlow, C. 1899. Another chapter on the nesting of *Dendroica occidentalis*, and other Sierra notes. Condor 1:59-60. **Excerpt:** Three nests of the Plumed Quail were found by us, all built in the tar-weed or "mountain misery" (*Chamaebatia foliolosa*), and all near paths or roads. The one shown in the illustration was built at the foot of a large cedar tree, and was nicely concealed and shaded by the foliage of the weeds. The nesting cavity was about six inches across and three inches deep, lined with feathers from the parent bird. It held ten eggs, in which incubation was well advanced. Several times the bird was flushed in order that we might observe the nest, but she was persistent and always returned. . . Another nest containing 11 incubated eggs was found on the same day, placed amongst the tar-weed in the shade of large cedars. This nesting cavity was about six inches in depth, and composed of dry leaves from the tar-weed and lined with feathers. From the nests observed it seems certain that the Plumed Quail makes a nest of its own, for the one last mentioned was substantial enough to bring home. On June 10 Mr. Carriger took a nest and 10 eggs built beside the road in the tar-weed three miles above Fyffe. The whistle of the Plumed Quail could be heard commonly through the woods, but the birds were seldom seen.
24. Barlow, C. 1900. An outing into the Pyramid Peak region of California. Condor 2:103-110. **Excerpt:** Plumed Quail (*Oreortyx p. plumiferus*). Commonly heard in the meadow at 7,500 feet, but very shy.
25. Barlow, C., and W. W. Price. 1901. A list of the land birds of the Placerville-Lake Tahoe Stage Road. Condor 3(6):151-184. **Notes:** Author includes information on calls, general behavior, breeding season, nesting habitat, and descriptions of nests and eggs. The mountain quail is "found commonly from about 2000 feet upward to the summit and is abundant in Lake Valley." Author notes that mountain quail begin nesting in May or early June, young were seen on Pyramid Peak as late as August 15, and by October the quail abandoned elevations over 5,000 feet.

26. Bateman, A. 1968. Raising mountain quail. *Game Bird Breeders, Aviculturalists, Zool. and Conserv. Gaz.* 16(2):11-13. **Notes:** Bateman discusses pen design and conditions, pairing, nesting structures, incubation, feed, and care of growing chicks. A range map, provided by the U.S. Fish and Wildlife Service is included along with a brief description of the range and habitat. Several photos of pens and caged birds are included.
27. Belding, L. 1892. Food of the grouse and mountain quail of central California. *Zoe* 3:232-234. **Excerpt:** The mountain quail (*Oreortyx pictus plumiferus*), which are so plentiful in the high mountains in summer, are only summer residents there. They usually spend the winter below the snow line, but as it is not possible to tell just where that is, or rather where it is going to be, they are sometimes caught in snow storms, but I have been astonished at the correctness of their apparent forecast of different winters. A few birds winter high in the mountains, but I think they are parts of flocks which were nearly annihilated, or young birds which got scattered and lost, and a few that were wounded and survived. They begin their journey on foot from the summit and east slope to the foothills, a little after the first of September, and by the first of October, when the game law allows them to be shot, they have nearly all escaped from the mountain hunters to run the gauntlet of those lower down, on the west slope. In some respects they are very stupid birds, in others, quite the reverse. When they are going from their summer to their winter resorts, birds of a flock can all, or nearly all, be shot if the flock can be turned from its course and scattered. They soon begin to call together and will nearly always respond to a hunter's imitation of their call. The loud pleasing call of the male in breeding season is not easily imitated nor described, though apparently consisting of a single note, which is sometimes varied a little. The service berry is the staple article of their food in fall, but they eat more or less of the different kinds of berries which the grouse eat. I suppose they, as well as the grouse, eat berries of the wild coffee (*Rhamnus californica*), but I have no data for a positive opinion. They also eat the acorn of the dwarf oak and seeds of the snow bush (*Ceanothus cordulatus*), and seeds of many small plants. I do not know that they eat any of the foliage mentioned as the food of the grouse, but they probably eat leaves of clover early in summer, just as valley quail do in winter. The juveniles eat a great many ants. Some seasons, when there are no berries and very few seeds, they live almost entirely upon the bulb of a species of grass, apparently *Melica bulbosa*, which grows at the head of springs and rivulets. The birds get the bulb by scratching. Such seasons they start for the foothills sooner than when food is abundant.
28. Belding, L. 1900. Tape worm in young mountain quail. *Condor* 2:91. **Excerpt:** About one in ten of the young Plumed Quail (*Oreortyx pictus plumiferus*) in Nevada, Placer, Eldorado and probably other counties in the Sierra Nevada are infested with tape worms. I have found the worms in the entrails, in the abdominal cavity and frequently under the loose skin of the abdomen, especially between the thighs and body. As I have never found a tape worm in an adult I suppose the

young afflicted quails die before they reach maturity. I can usually distinguish the diseased bird by its sickly appearance. I do not know that these tape worms are dangerous to man but have reasons for thinking they are. Since 1885 I have never eaten a young Mountain Quail without skinning it and examining the bird very carefully. How the bird acquires the worm and what the name of the latter is, --if it has one,-- is unknown to me. I have made three ineffectual attempts to get the species identified through alcoholic specimens, but failed to get a report. Have been informed that tape worms are sometimes, though rarely, found in the young Sooty Grouse of the Sierra Nevadas.

29. Belding, L. 1901. May in the high Sierras. Condor 3:31-32. **Notes:** States that the plumed partridge (*Oreortyx p. plumiferus*) is common.
30. Belding, L. 1903. The fall migration of *Oreortyx pictus plumiferus*. Condor 5:18.
Excerpt: The fall migration of the mountain quail (*Oreortyx pictus plumiferus*) appears to be influenced but little by the food supply or temperature in its summer habitat in the Sierras which it appears to leave because the proper time has arrived for its annual tramp down the west slope. The first flocks start about the first of September, or sometimes two or three days sooner. At Webber Lake after three cold cloudy days, they began to move westward August 28, 1900. When they are migrating their whistle is frequently heard, and they do not seek cover for protection but follow a wagon road, railroad, travel in snow sheds, pass near dwellings, and seem to care but little for self preservation. Several flocks used to come down to the foot of Stanfield Hill, Yuba County, which for eight years was my favorite shooting grounds, and there spend the winter. They would arrive about the middle of October. One year they did not come at all, and I wondered if they could foretell the mildness or severity of the coming winter, for that winter was a mild one, excepting that October was unusually cold and stormy. Their regularity in leaving the mountains without regard to food, temperature, or size of young has mystified me quite as much as *Anthus pensilvanicus*, and other northern breeding birds which I found in southern Lower California. Why they should remain in the tropical climate of Cape San Lucas until the first of May and then depart for their northern breeding grounds at the same time when they start north from the much more northern central California puzzled me, for there was no perceptible change in climatic conditions about the first of May, and indeed scarcely a change in them, at the Cape, during the two or three preceding months.
31. Bendire, C. 1892. Life histories of North American birds. U.S. Natl. Mus. Spec. Bull. 1(1):1-446. **Notes:** Author presents information on *Oreortyx pictus* (Douglas), *O. p. plumiferus* (Gould), and *O. p. confinis* (Anthony) including geographical range, physical descriptions, introductions, voice, reproduction, egg morphology, habitat, distribution, foods, clutch size, and general behavior.
32. Bent, A. C. 1963. Life histories of North American gallinaceous birds. U.S. Natl. Mus. Bull. 162. Dover Publ., Inc., New York, N.Y. 490pp. **Notes:** Bent

presents the following information about the mountain quail (*Oreortyx picta palmeri* Oberholser), the plumed quail (*O. p. picta* Douglas), and the San Pedro quail (*O. p. confinis* Anthony): habits, nesting, eggs, distribution, range, migration, egg dates, courtship, young, plumages, food, behavior, voice, game (hunting), enemies, fall activities, and winter activities. The majority of the text is composed of direct quotes from the literature.

33. Block, W. M., L. A. Brennan, and R. J. Gutiérrez. 1987. Evaluation of guild-indicator species for use in resource management. *Environ. Manage.* 11(2):265-269. **Abstract:** We followed selection guidelines commonly used by management agencies to select mountain quail (*Oreortyx pictus*) as an indicator species for an ecological guild of birds. We then evaluated the ability of mountain quail to indicate the presence of other species from the guild and to index the quality of the habitat for other species. The ability of quail to indicate the presence of species from the ecological guild varied widely within and among vegetation types. Species compositions of the ecological guild were more consistent in comparisons of sites within vegetation types than they were in comparisons of sites between vegetation types. Mountain quail habitat was significantly different from the habitats of sympatric species from the guild for 14 of 15 multivariate contrasts. We suggest that managers use indicator species with caution. If indicators are used, they should be applied to guilds composed of species that closely share ecological affinities. The habitat of the indicator species should overlap extensively with those of all other guild members. The use of indicators should be restricted to very similar sites within the same general vegetation type.
34. Boccard, B. 1980. Important fish and wildlife habitats of Idaho: an inventory. U.S. Fish and Wildl. Serv. 165pp. **Notes:** Boccard describes the geology, topography, climate, biological communities, human activities, and common flora and fauna of the following regions in Idaho: northern Rocky Mountains, Columbia intermontane, basin and range, and middle Rocky Mountains. This report also provides information on 49 important fish and wildlife habitat locations throughout the state. Some sites are ranked by priority and detailed information is provided on the following: wildlife species, habitat and significant ecosystem values; threat of destruction and degree of protection; ecosystem description; ownership information; other available information; and additional comments. Information on unranked sites includes a description of the area, ownership, and other general comments.
35. Boccard, B. 1980. Important fish and wildlife habitats of Oregon: an inventory. U.S. Fish and Wildl. Serv. 142pp. **Notes:** Boccard describes the geology, topography, climate, biological communities, human activities, and common flora and fauna of the following regions in Oregon: Coast Range; western interior valleys; Siskiyou Mountains; western and eastern slopes of the Cascades; high lava plains; Ochoco, Blue, and Wallowa Mountains; basin and range; and Owyhee upland. This report also provides information on 31 important fish and wildlife

habitat locations throughout the state. Some sites are ranked by priority and detailed information is provided on the following: wildlife species, habitat and significant ecosystem values; threat of destruction and degree of protection; ecosystem description; ownership information; other available information; and additional comments. Information on unranked sites includes a description of the area, ownership, and other general comments.

36. Bock, C. E., and J. F. Lynch. 1970. Breeding bird populations of burned and unburned conifer forest in the Sierra Nevada. *Condor* 72:182-189. **Excerpt:** In August 1960 the 39,000-acre Donner Ridge fire passed within several hundred yards of the University of California Sagehen Creek Field Station in Nevada County, California. In 1965 two permanent study plots of 20.9 acres each were established northeast of the station, one in the burn and the other in adjoining unburned forest. Long-term studies were initiated for the purpose of recording floral and faunal changes on the burn as it recovers, using the unburned plot as a control or projection of what the burned area eventually should resemble. This paper presents a comparison between the breeding avifaunas of the two areas based upon censuses taken in 1966, 1967, and 1968, when the burned study plot was still in the early stages of recovery.
37. Booth, E. S. 1950. *Birds of the west*. Stanford Univ. Press, Calif. **Notes:** Author includes physical description, nest, and distribution for *Oreortyx picta palmeri* and *O. p. picta*.
38. Bowles, J. H. 1911. Notes extending the range of certain birds on the Pacific slope. *Auk* 28:169-178. **Excerpt:** In the vicinity of Tacoma and throughout most of the Puget Sound country this quail is an abundant resident. Owing to different previous importations of both forms, occasional examples showing traces of *O. p. plumifera* are found, but *picta* is the typical form.
39. Brennan, L. A. 1984. Summer habitat ecology of mountain quail in northern California. M.S. Thesis, Humboldt State Univ., Calif. 71pp. **Abstract:** Mountain quail (*Oreortyx pictus*) habitat ecology was studied at four areas in northern California (Modoc Plateau, northern Sierra Nevada Mountains, Klamath Mountains, and northern California Coast Range) between June and October 1982 and April and October 1983. In an analysis of macrohabitat selection at these four areas, mountain quail used all vegetated cover types in proportion to their availability. A multivariate analysis of microhabitat selection based on a two-group sample (used $n = 190$, available $n = 100$) of habitat data (15 variables measured at 0.02 hectare circular plots) indicated mountain quail were associated with a specific microhabitat structure. The five habitat variables (distance to water, distance to cover, minimum shrub height, maximum shrub height, and percent shrub cover) included in a habitat selection model based on stepwise logistic regression showed a high level of statistical significance between the used and available habitat groups and low intervariable correlation coefficients ($r < 0.4$).

The stepwise selection process of logistic regression was used to rank the statistically significant and minimally redundant variables in order of their statistical importance and to derive a function which classified over 79 percent of the habitat plots to the correct group. The presence of water in association with a vegetation structure dominated by shrubs were the most important mountain quail habitat components. Mountain quail densities were estimated with a variable-distance line transect method. Densities ranged from 3.7 birds per 40 hectares on the Modoc Plateau to 21.5 birds per 40 hectares in the Klamath Mountains.

40. Brennan, L. A. 1989. Report on a survey of mountain quail habitat in eastern Oregon, southeastern Washington, western Idaho and northern Nevada. Unpubl. Rep. The Chukar Found., Boise, Id. 58pp. **Excerpt:** The recent decline and range contraction of Mountain Quail (*Oreortyx pictus*) populations in Idaho prompted the Chukar Foundation to sponsor a meeting on the biology and current status of this bird during June 1989. One result of this meeting was a decision to support a broad-scale survey of Mountain Quail habitats in areas where populations have declined in Oregon, Washington, Idaho and Nevada. The objective of this survey was to assess the quality of habitats on the eastern part of the geographic range of Mountain Quail using qualitative and quantitative techniques. The overall goal of this study was to determine if a lack of quality habitat might be responsible for the Mountain Quail population declines observed in the eastern part of its range.
41. Brennan, L. A. 1990. What happened to the mountain quail in Idaho? Quail Unlimited 9:42-43, 69. **Notes:** This article includes general information on the life history, habitat preferences, remaining populations, distribution, and causes of habitat loss for mountain quail in Idaho. Brennan discusses how dams and impoundments, agriculture, and grazing have reduced habitat for mountain quail and how the remaining island populations are susceptible to local extinctions. Suggestions for habitat improvement are also presented.
42. Brennan, L. A. 1991. Regional tests of a mountain quail habitat model. Northwest. Nat. 72:100-108. **Abstract:** A mountain quail (*Oreortyx pictus*) habitat model developed with data from northern California was tested using data from 750 plots measured at 16 sites in Idaho, Washington, Oregon, and Nevada. Accuracy of model output was assessed using habitat data from sites known to support mountain quail populations. In 15 out of 16 instances, the model accurately predicted that a test site represented mountain quail habitat. These tests represent one method for habitat model evaluation. Additional strategies for testing this data-based habitat model are discussed.
43. Brennan, L. A. 1993. Strategic plan for quail management and research in the United States: introduction and background. Pages 160-169 in K. E. Church and T. V. Dailey, eds. Quail III: Natl. Quail Symp. Kans. Dept. Wildl. and Parks, Pratt. **Abstract:** I assessed the current, broad-scale status of populations,

research, and management for 6 species of quail in the U.S., and used this information as an introduction, background, and justification for a national strategic planning effort for quail management and research. Long-term (1960-89) trends determined from Christmas Bird Count data indicate that California quail (*Callipepla californica*), northern bobwhite (*Colinus virginianus*), and scaled quail (*Callipepla squamata*) populations have undergone ($P < 0.05$) declines. Geographic distribution of mountain quail (*Oreortyx pictus*) has contracted dramatically in the northeastern portion of this quail's range. Neither Gambel's (*C. gambelii*) nor Montezuma quail (*Cyrtonyx montezumae*) showed evidence of long-term increases or decreases. Wildlife professionals have apparently paid scant attention to quail in the U.S. during the past 10 years. A recent survey of *Wildlife Review* indicated $< 0.2\%$ of the publications pertained to quail. During 1990, $< 1.0\%$ of Federal Aid in Wildlife Restoration funds were allocated to quail-related projects. Habitat management by the private sector is apparently having little broad-scale impact on bobwhite populations. Contemporary quail management efforts in the U.S. are clearly in the doldrums and in dire need of leadership from professionals with a creative vision for solving problems caused by changing land-use practices. These factors point to a critical need for a national strategic planning effort to develop a comprehensive coordinated program for quail management and research. An outline of the structure of the Strategic Planning Workshop that was held at Quail III is provided. Specific management and research problems and associated strategies for solving them are available in Issues and Strategies, which follows.

44. Brennan, L. A. 1993. Strategic plan for quail management and research in the United States: issues and strategies. Pages 170-171 in K. E. Church and T. V. Dailey, eds. Quail III: Natl. Quail Symp. Kans. Dept. Wildl. and Parks, Pratt. **Excerpt:** This portion of the plan identifies several broad actions that can be implemented immediately. It is followed by 5 sections on specific issues and strategies: (1) agricultural practices and pesticides, (2) forest practices, (3) grazing and range management, (4) releases of pen-raised quail, and (5) population dynamics and hunting.
45. Brennan, L. A. 1994. Broad-scale population declines in four species of North American quail: an examination of possible causes. Pages 44-50 in Sustainable ecological systems: implementing an ecological approach to land management. U.S. For. Serv. Gen. Tech. Rep. RM-247. Rocky Mt. For. Range Exp. Stn., Fort Collins, Colo. 363pp. **Abstract:** Christmas Bird Count (CBC) data from 1960-1989 indicate that California quail (*Callipepla californica*), northern bobwhite (*Colinus virginianus*), and scaled quail (*Callipepla squamata*) populations have experienced significant declines in major portions of their geographic ranges. Additionally, surveys and hunter bag returns during the past 50 years indicate that mountain quail (*Oreortyx pictus*) populations have experienced a series of local extinctions across broad areas (several thousand km²) in Idaho and Nevada. Although changing land uses can be related to these declines, no single factor can

be linked to all species. For northern bobwhites, clean farming methods in agricultural environments and intensive, high-density pine-dominated silviculture seem to be the two major reasons for broad-scale population declines, especially in the southeastern states. For mountain quail, regional extinctions in Idaho and Nevada are apparently related to two factors: (1) intensive agriculture and associated hydro-power reservoir impoundments along the Snake River corridor, and (2) disruption of key habitat resources along secondary riparian corridors by excessive cattle grazing. Factors responsible for declines in California quail and scaled quail populations are at present unknown, but are apparently related to abuses associated with excessive grazing of western rangelands. Management strategies that can be used to sustain quail populations in wildland environments are summarized in an ecological context.

46. Brennan, L. A., and W. M. Block. 1985. Sex determination of mountain quail reconsidered. *J. Wildl. Manage.* 49:475-476. **Excerpt:** Pine (J. Wildl. Manage. 45:1056-1057, 1981) demonstrated mountain quail (*Oreortyx pictus*) sexual distinction based on plume lengths from a Monterey County, California, population. Earlier, Van Rossem (*Condor* 39:20-24, 1937) showed a large degree of plume length overlap between male and female mountain quail. The purpose of this paper is to show that lack of overlap in mountain quail plume length may be unique to mountain quail in the Monterey County area and therefore of little use as a technique for distinguishing the sex of this species. **Notes:** Tables compare six morphometric characteristics (weight, wing, plume, culmen, tarsus, and claw) of mountain quail collected between October and May, 1894-1976, from Washington, Oregon, and California, U.S.A., and Baja California, Mexico. Another table shows the overlap of plume lengths of male and female mountain quail, comparing the authors' study data to sets of data from other studies.
47. Brennan, L. A., and W. M. Block. 1986. Line transect estimates of mountain quail density. *J. Wildl. Manage.* 50:373-377. **Abstract:** We estimated the density of 4 populations of mountain quail (*Oreortyx pictus*) in northern California during the breeding season (May-June) 1983. Estimates of density (D) were obtained from Fourier series analyses of perpendicular distance data. D values ranged from 9 to 30 quail/100 ha, with associated coefficients of variation (CV) < 20%. Percent relative density values calculated from the estimates of D compared favorably with percent relative number of quail detected/km of transect. In general, mountain quail were behaviorally compatible with line transect sampling.
48. Brennan, L. A., W. M. Block, and R. J. Gutiérrez. 1986. The use of multivariate statistics for developing habitat suitability index models. Pages 177-182 in J. Verner, M. L. Morrison, and C. J. Ralph, eds. *Wildlife 2000: modeling habitat relationships of terrestrial vertebrates*. Univ. Wis. Press, Madison. 470pp. **Abstract:** We develop Habitat Suitability Index (HSI) models based on linear and nonlinear multivariate statistical analyses. The combination of discriminant function analysis (DFA) and all possible subsets regression (APSR) was used to

develop a linear HSI model, and stepwise logistic regression (SLR) was used to develop a nonlinear HSI model. As examples, we describe the development of mountain quail (*Oreortyx pictus*) HSI models based on a two-group analysis of used (mountain quail present) and available (randomly located) habitat data. We used the linear and nonlinear methods to derive classification functions, and we compared the classification power of both functions. We also compared the error terms, confidence regions, and goodness-of-fit statistics associated with each model. The nonlinear SLR fit our data better than the linear DFA-APSR model and provided better group separation as well. The output of the linear and nonlinear models was tested with habitat data from different areas of mountain quail use. We conclude that HSI models can be developed with either linear or nonlinear regression techniques and that the structure of HSI models should be tested with long-term population data for validity.

49. Brennan, L. A., W. M. Block, and R. J. Gutiérrez. 1987. Habitat use by mountain quail in northern California. *Condor* 89:66-74. **Abstract:** We studied habitat use by Mountain Quail (*Oreortyx pictus*) at four sites in northern California. Vegetative cover types (macrohabitats) were used in proportion to availability. Significant microhabitat variables which distinguished used from available microhabitat structure included proximity to water and tall, dense shrubs. Mountain Quail population densities ranged from 9 to 30 birds per 100 ha; populations with greater densities used a larger range of the available microhabitat structure.
50. Brennan, L. A., R. J. Gutierrez, and W. Rosene. 1993. Strategic plan for quail management and research in the United States: issues and strategies -- forest practices. Pages 174-175 in K. E. Church and T. V. Dailey, eds. *Quail III: Natl. Quail Symp.* Kans. Dept. Wildl. and Parks, Pratt. **Excerpt:** Forest management, like agriculture, has a profound influence on distribution and abundance of quail populations. Participants in the Forest Practices section of the workshop identified a broad array of issues and strategies that relate to management of quail in forest environments. There was a general consensus that a severe polarization of views exists between many wildlife and forestry professionals with respect to impacts of forest management actions on quail. A great deal of this polarization is rooted in the different educational philosophies of many contemporary forestry and wildlife programs that provide University training for professionals. Therefore, this section of the Strategic Plan is divided into 2 categories: (1) general issues relating to communication and cooperation between wildlife and forestry professionals and (2) specific problems faced by quail in particular silvicultural systems or regions.
51. Brown, D. E. 1973. Potential of mountain quail to adapt to the montane conifer forest and interior chaparral in Arizona. Pittman-Robertson Spec. Rep. Proj. W-53-R-23. 13pp. **Excerpt:** It is suggested that wild trapped mountain quail of one of the southeastern races, preferably from Joshua Tree National Monument or San Bernardino National Forest, may adapt to suitable habitats in Arizona. If such a